

Summary

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Methodological News contains articles on a range of topics from across different areas within the Methodology Division in the ABS. This issue there is an article on measuring the statistical impact of process change, an article about a new estimator of the proportion of correct links in a linked dataset and an article on using generalised regression to form estimates that include units out of scope of agricultural surveys.

Statistical Impact Measurement Framework

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The ABS is re-engineering many statistical business processes across a large number of statistical lines as part of the Statistical Business Transformation Program. This re-engineering carries with it some risk to the continuity of time series for the statistics that are produced. Of key concern is the potential to produce statistics that are inconsistent with past estimates due to process change.

While assessing the impact of process change on time series is not new, often significant effort is devoted to detecting, measuring and adjusting for an impact on the statistics produced. The Statistical Business Transformation Program is ramping up and the volume of work to assess the statistical impact due to changes to business processes will increase. As such, there is a need to be able to quickly assess the impact on key statistics as transformation is widely undertaken. The Statistical Risk and Quality Assurance (SRQA) section is developing a generic Statistical Impact Measurement Framework (SIMF) that will be able to be applied to all series based on aggregating unit level data, dealing with any change to current statistical business processes. The aim of the framework is to streamline and accelerate the identification and management of statistical risk.

During the development of the SIMF, it will be tested on historical changes that have been implemented at the ABS. For example, the SIMF has already been tested on surveys where web forms were introduced as a new collection option in 2012. However, since the Statistical Business Transformation Program has the potential to bring in new or different opportunities for statistical impact, simulations will also be used to test the SIMF for scenarios that have yet to happen. This will give an indication of the robustness and power of the framework while also identifying its limitations. The development of the framework will draw on the knowledge and experience of the Methodology Advisory Committee, with a paper to be put forward in June 2016. The committee will seek to provide advice on the validity of the framework as well as guidance with respect to its application during the implementation of the Statistical Business Transformation Program.

The general idea of the framework is to compare the units that were in sample both before and after the change. While not all the units may have been included in a trial, an impact can be detected if the units that were not in the trial were distinctly different to the units that were. A general linear model with a stepwise model selection method is used to determine whether the trial group was impacted statistically or not when assessing the response values. Response rate comparison between the trial group and the control group can also be compared using a logistic regression model.

Further Information

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Measuring Precision for Deterministic and Probabilistic Record Linkage

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Record linkage is the act of bringing together records from two files that belong to, or are likely to belong to, the same unit (e.g. person, student, business). Record linkage is an appropriate technique when data sets need to be joined to enhance dimensions such as time and breadth or depth of detail. For example, the Australian Census Longitudinal Database (ACLDB), created by linking the 2006 and 2011 Australian Population Censuses, allows longitudinal analysis. Record linkage offers opportunities for new statistical output and analysis at relatively low cost.

With these new opportunities comes the associated problem of linkage errors. Because a unique person identifier is often not available, records belonging to two *different* people may be incorrectly linked. Estimating the proportion of links that are correct, called Precision, is difficult because, even after clerical review, there will remain some uncertainty about whether a link is in fact correct or incorrect. Links can be declared deterministically, using a set of pre-defined rules, or probabilistically, where evidence for a link being a match is weighed against the evidence that it is not a match, both of which are widely used in practice.

We have developed an estimator of Precision for a linked file that has been created by either deterministic or probabilistic linkage, both of which are widely used at the ABS. We have demonstrated that the proposed estimators perform well in simulation and in real case studies. The ABS' deterministic macro, D-MAC, produces associated precision estimates.

Further Information

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Modelling Small Size Units Using a GREG Estimation Technique

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Traditionally the scope of ABS agricultural surveys, including the agricultural census, has included all businesses undertaking agricultural activity above a minimum size cut-off relating to their agricultural operations. Since 1993-1994 this cut-off has been set at \$5,000 based on the size variable used in agriculture surveys, Estimated Value of Agricultural Operations (EVAO) or an equivalent proxy based on tax data.

A National Agricultural Statistics Review was undertaken in 2013 and 2014 by the ABS and the Australian Bureau of Agricultural Resource Economics and Sciences (ABARES). In light of the findings from the review, the ABS has reviewed the scope cut-off for its agricultural collections and decided to raise the minimum scope cut-off value for the 2015-2016 agricultural census and Land Management Practices Survey (LaMPS) to \$40,000. This change in scope will achieve several benefits, including

- improved coherence of ABS data with data released by ABARES, through aligning the ABS definition of an agricultural business with the definition used by ABARES
- significantly reduced respondent burden (with approximate savings of up to \$3 million in provider time)
- improved efficiency of collection processing and timeliness of outputs.

It is anticipated that the increase in the scope cut-off will have minimal impact on the majority of estimates in the 2015-2016 agricultural census and LaMPS. In order to ensure comparability and coherence with data from previous agricultural censuses and surveys can be retained, the ABS has investigated modelling options to account for the impact of the scope change on estimates.

In particular, a Generalised Regression (GREG) estimation methodology has been proposed incorporating a GREG model based on the size variable. The model would be implemented for the small size units just above the new cut-off, with the benchmark totals accounting for those units below the cut-off as well as the units just above the new \$40,000 cut-off. In this way, the units above the new cut-off would represent the units below the cut-off through the GREG weight adjustment. The modelling essentially assumes the same model of variable by size exists above and below the new cut-off.

An advantage of the GREG approach is that it does not require the creation and maintenance of separate models for individual items. Additionally, the model can be incorporated into current ABS estimation systems, and the quality of the modelling will be able to be reflected through the production of Relative Standard Errors (RSEs) output by the system.

Results from testing the method on three recent agricultural collections have shown that the GREG modelling approach could be a viable option for accounting for the increased scope cut-off in agricultural estimates. Further work will be undertaken to refine the approach and to determine the best use of these outputs in informing users of

agricultural census and LaMPS data.

Further Information

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Methodological News features articles and developments in relation to methodology work done within the ABS Methodology Division. By its nature, the work of the Division brings it into contact with virtually every other area of the ABS. Because of this, the newsletter is a way of letting all areas of the ABS know of some of the issues we are working on and help information flow. We hope the Methodological Newsletter is useful and we welcome comments.

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About this Release

The Methodological News is a quarterly information bulletin from the Methodology and Data Management Division. The newsletter features articles and developments in relation to work done with the division.

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